

 UNIVERSITY
OF WYOMING

Science Initiative



The Big Bang



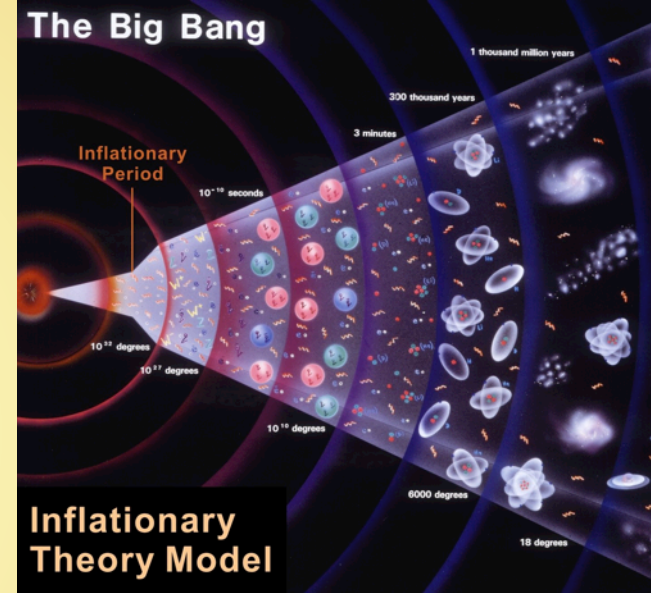
Christopher Wren



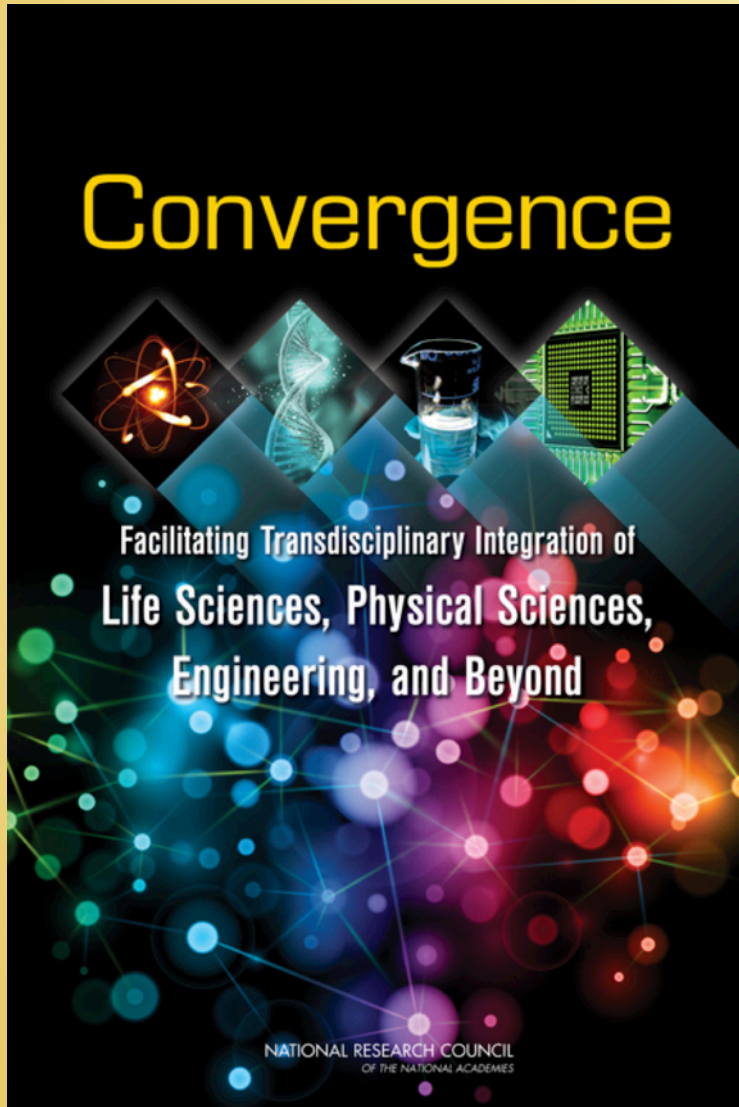
Robert Hooke



Edmund Halley



Center for Integrative Biological Research (CIBR)



- Innovative research to translational applications
- Requires a culture and supporting structures
- Core facilities and workspaces designed for convergent research
- Fostered by new education and training programs

CIBR will include

- Incubation areas or “collision spaces”
- Co-location with the Center for Advanced Scientific Imaging (CASI)
- State-of-the-art animal and plant facilities
- Interaction with physical sciences
- Modern lab/office suites

CIBR Incubation Areas and Research Lab Suites

Where great ideas collide and convergent research gets done

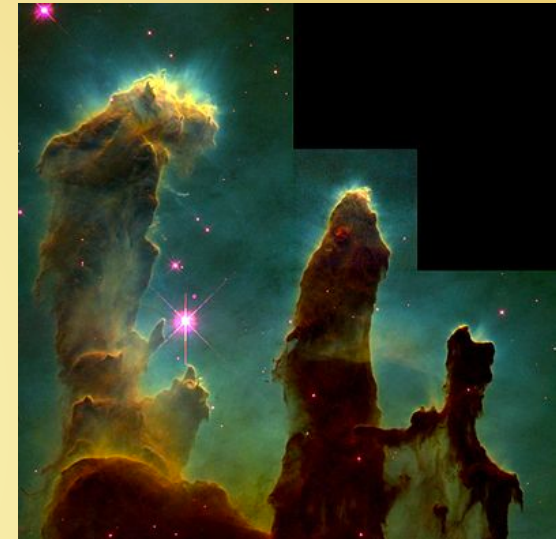
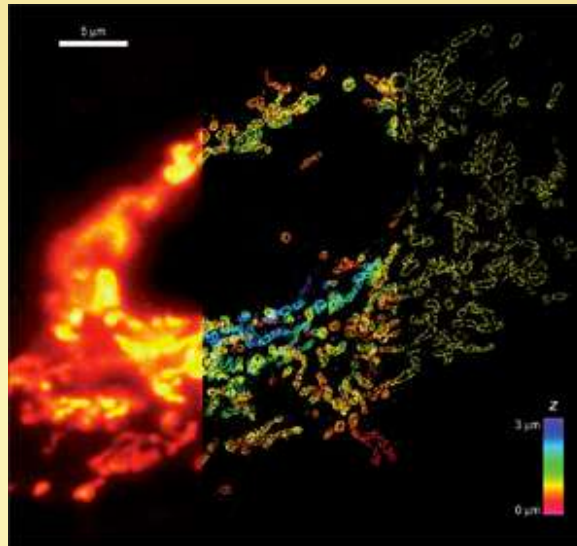


CIBR Plant Growth Facility

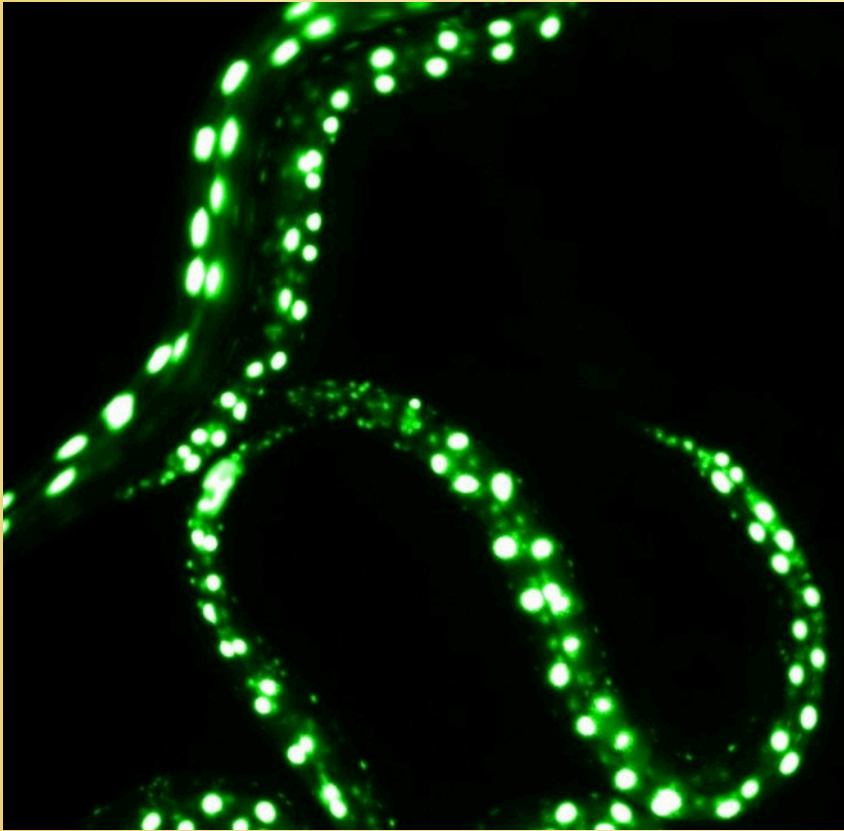
- Drought impacts on crops
- Invasive species
- Functional genomics
- Forest bioenergy and hydrology
- Sustainable ecosystem services



CIBR Laboratory Animal Facility



Center for Advanced Scientific Imaging: Merging Chemistry, Physics and Biology

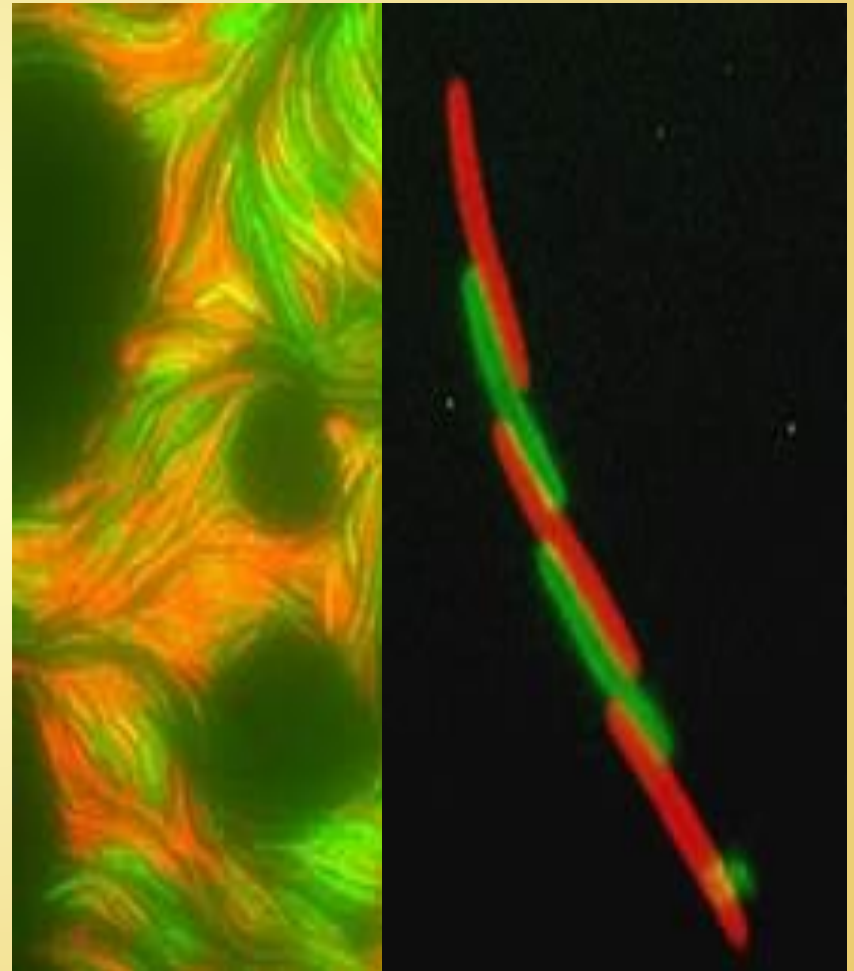


- Research is not competitive unless one can integrate:
 - Structure / function relationships
 - Location of processes within the 3-D matrix of the cell
 - Dynamic movement of the key proteins
- Chemistry and biology merge when imaging achieves near molecular resolution.

For example, Rb protein regulates cell cycle and is mutant in 90% of cancers.

Center for Advanced Scientific Imaging: A Model for Integrated Science

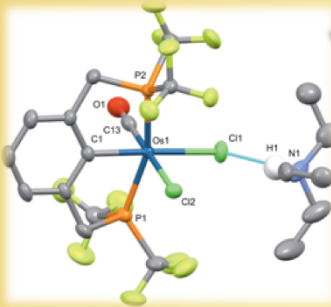
- Lifestyle change after cell to cell communication between bacteria by direct protein transfer.
- Key requirements:
 - Genetics / recombinant DNA / dynamic imaging at protein resolution.
 - Collaborative research among microbiologists, chemists and physicists.



CASI: Research Convergence

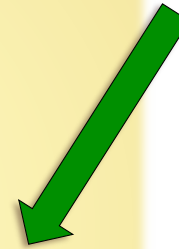
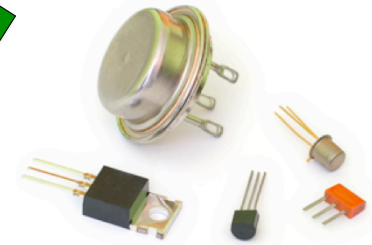
Chemistry

"poor measurements on pure materials"



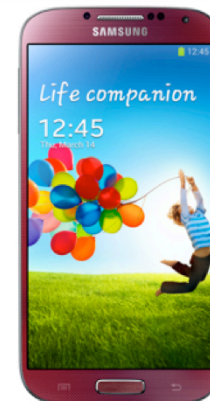
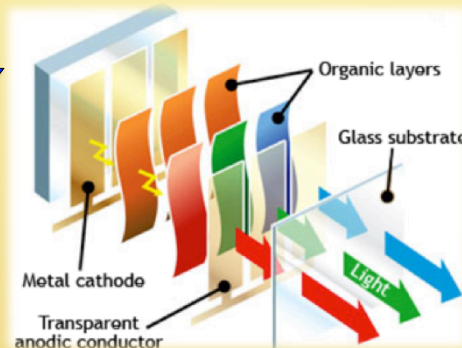
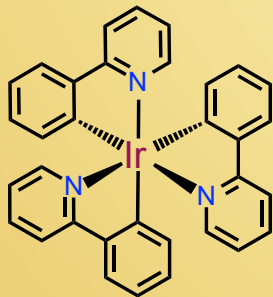
Physics

"good measurements on impure materials"

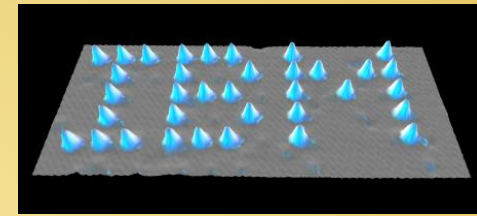


Nanoscale Science

"rational assembly of atoms into materials and devices on the atomic scale"



Modern atomic imaging



- Atomic Force Microscopy
- Scanning Electron Microscopy
- XPS/surface analysis
- NMR & MS support facilities

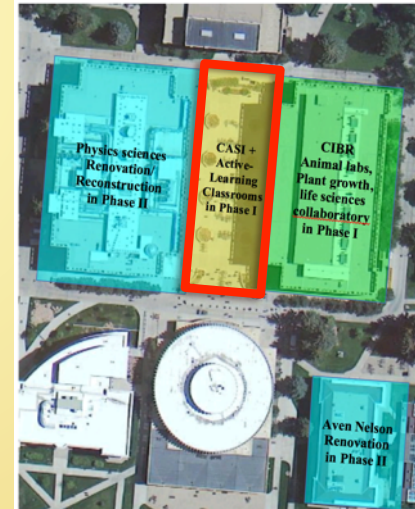
Materials for the 21st century:

- photovoltaics
- batteries, fuel cells
- optical electronics

Currently: ~ 6 chemistry & physics materials research groups at UW



virtually unique
in academic science

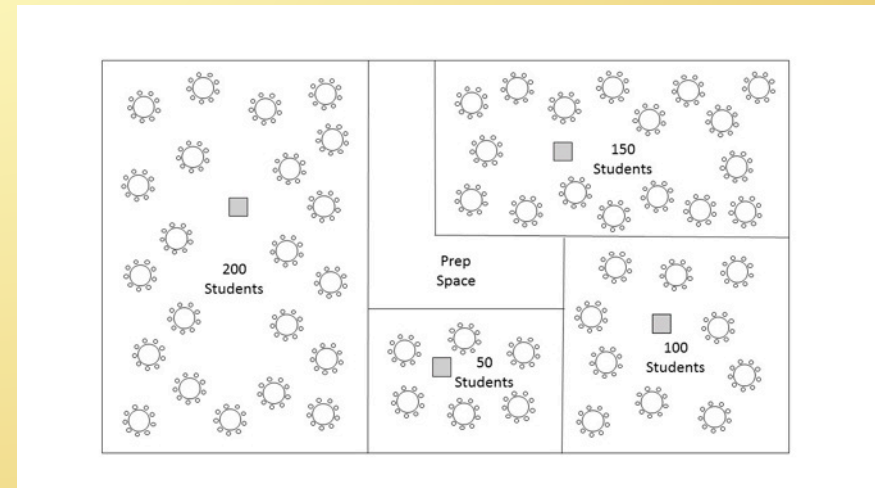


- Scattered around campus; "Balkanized"
- unnecessary duplication, limited support

- centralized, consolidated
- integrated technical support
- **research synergy**

Active Learning Classrooms (ALCs)

- National and UW research demonstrates increased student success and engagement using Active Learning approaches
 - Increased **student retention** – 95% compared to 80%
 - Improved **student learning** – 45% **learning gains** compared to 22% learning gains
 - Students are **1.5 times more likely to fail** in traditional lecture settings
 - Increased interest in science and desire to enroll in more science classes
- Proposed construction: 4 ALCs (200, 150, 100 and 50-person rooms)
 - ALCs replace theater-style lecture halls with single-floor interactive learning spaces – students **collaborate in groups of 6-9**
 - **All SI department courses** enrolling >40 students would be taught in these 4 rooms
 - Includes courses for majors and non-majors (**72% of all UW students** enrolled in one of these classes)
 - **All Pre-service K-12 Teachers** will take SI classes in ALCs – model AL teaching approaches
 - **3750 students will be immersed in Active Learning each semester**





LAMP

Learning Actively Mentorship Programs

Illuminating the Path to Success in the Sciences

- Success of ALCs requires intensive and ongoing mentoring in AL strategies
- LAMP will employ 2 full-time SI Instructional Facilitators
- Each year, a new cohort of SI faculty and grad students will be mentored and supported through:
 - A week-long intensive LAMP Summer Institute
 - Weekly faculty development program and graduate student seminar series
 - Biweekly Brown Bag Readings Series
 - Weekly visits to courses taught by LAMP Instructional Facilitators in ALCs to serve as models
 - Frequent visits to faculty and grad student classrooms by Instructional Facilitators to provide feedback and ideas for AL strategies
 - Assist faculty and grad students in developing, implementing and publishing research studies on Active Learning strategies in ALCs – UW could become center of AL research in the sciences
- Each year, a group of 40 undergraduates will be trained and mentored to serve as teaching assistants in ALCs (seek out K-12 pre-service teachers):
 - Weekly seminars on Active Learning strategies and how to facilitate AL in ALCs
 - Individual coaching in ALCs
 - Opportunity to develop and implement AL session in one of the SI classes

Phase II – Renovations & WAO

Renovations:

- Aven Nelson Building
- Biological Science (vacated teaching labs)
- Physical Science (vacated teaching labs)
- Molecular Biology wing of AS/MOLB

Wyoming Astronomical Observatory (WAO)



Timeline

Science Initiative Facility Construction & Renovation



Science Initiative Programs & Support



Budget

Phase I Transformative Facilities. CASI-CIBR integrated facility	\$100,000,000
Phase I Research Innovation and Training Programs	<u>\$5,410,000</u>
Total Phase I	\$105,410,000
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Phase II – Renovations	\$45,700,000
Transformative Facility - WAO	\$44,300,000
Phase II Research Innovation and Support Programs	<u>\$860,000</u>
Total Phase II	\$90,860,000
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Total construction & building renovation request	\$190,000,000
Total permanent request (Programs, Training, Support)	<u>\$6,270,000</u>
Grand Total Science Initiative Request	\$196,270,000